

– The radial fluid stiffness, K_B , increases much faster with increasing shaft eccentricity. This means that as the rotor moves away from the center of the bearing in the SFCB, the stiffness (and therefore the restoring forces) are much larger and increase much faster. This tends to keep the rotor “self-centered” and also means that the SFCB has significantly better stiffness and load-carrying capacity than conventional bearings, particularly at low eccentricities. Figure 7a shows the Direct Dynamic Stiffness (DDS) for the drive end radial SFCB with the compressor at zero rotative speed. Because the perturbator can be rotated either with or counter to the direction of compressor shaft rotation, both forward and reverse values for DDS are shown, illustrating the symmetry. For illustrative purposes, the system’s DDS is shown as two distinct

components: the bearing’s stiffness, $K_{D(Bearing)}$, and the casing stiffness, $K_{D(Casing)}$. Figure 7b shows a similar plot with the compressor running at a constant speed of 7,000 rpm.

The following observations from these figures are noteworthy:

- The bearing provides very high stiffness at zero rotative speed.
- There is virtually no difference in stiffness characteristics between the compressor when stopped and when running at 7,000 rpm. This indicates that the system is extremely stable and that there is no fluid inertia effect or fluid circumferential average velocity ratio (λ) that can cause the system to go unstable.

Summary

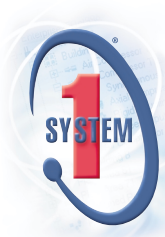
Experimental testing on a modified Clark 1M6 compressor resulted in clear understanding of the differences between behavior of a conventional

hydrodynamic sleeve bearing and Bently Nevada’s new ServoFluid™ Control Bearing. Direct Dynamic Stiffness, λ (lambda), eccentricity ratio, independently adjustable damping, and attitude angle were all observed experimentally using perturbation techniques. The new bearing’s design was found to have numerous advantages, including excellent stability from zero through operating speed. It was shown that conventional hydrodynamic bearings rely on their bearing characteristics to be generated at higher eccentricities (journal closer to the bearing wall), while the ServoFluid™ Control Bearing’s characteristics are generated by the differential fluid flow across the journal surface – at much lower eccentricities.

More information on the ServoFluid™ Control Bearing is available in the brochure attached to this issue of ORBIT, from your nearest Bently Nevada sales or service professional, or at our website, www.bently.com. ↻



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